SWIM and Horizon 2020 Support Mechanism

Working for a Sustainable Mediterranean, Caring for our Future

Alternative technologies for olive mill wastewater management with emphasis on soil application

Presented by:

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OMW – Current situation

More 15 million tons of olive mill wastewater (OMW) is produced each year by a large number of small olive mills scattered throughout the Mediterranean countries

Although OMW is a natural product, it can pollute water bodies and the environment because of its composition:

- High BOD (up to 50 g/l) and COD (up to 100 g/l)
- Low pH (≤5)
- High EC (7-11 dS/m) and ion content (mostly K)
- High phenolic content
- Smell and color
- Toxic properties for living organisms

Due to pollution load it is not allowed to be descarded untreated op without control to the environment, especially in water bodies.

Olive by-products

OLIVE TREE

Olives
Table Olives/Olive Paste
Olive Oil
extraction / separation
Pomace
Protein enrichment
Animal food
solvent extraction
Woody biomass
Energy generation (thermal)
Seed oil
Biodiesel production
Olive Mill Wastewater
Anaerobic digestion
Volatile Fatty Acids (VFA)
Aerobic process
Polyhydroxy-alkanoates (PHA)
biotechnological transformation
Flavours & Novel Antioxidants
physicochemical processing
Natural Antioxidants
Leaves
Wood Cuttings
sedimentation /filtration
Suspended solids
Wastewater (high COD)
Aerobic fungi fermentation
ENZYME production
composting
Sludge
anaerobic digestion
Wastewater (low COD)
Irrigation water (light fertilization)
char cycling
Fertilizers / soil amendments
Fungi production
Biogas
phytoremediation with poplars
Energy generation (thermal)
ENZYME production
Energy generation (electrical & thermal)
White wood production

Federici F., Fava F., Kalogerakis N. and D. Mantzavinos, "Valorisation of agro-industrial by-products, effluents and waste: concept, opportunities and the case of olive mill wastewaters", *J Chem Technol Biotechnol*, 84, 895-900 (2009).

OMW treatments

A large number of treatments/technologies (physical, chemical, biological) have been tested in many countries, such as:

- Evaporation ponts (lagooning)
- Use of membranes. High cost, not affordable for small oil mills.
- Decentralized natural systems (constructed wetlands) using different plant species.
- Chemical treatment using limestone (precipitation of suspended solids with increase of pH of OMW).
- Anaerobic biological treatment mostly driven by bacteria, with biogas production
- Aerobic treatment using specific aerobic microorganisms (has a very high cost of construction and operation).
- Production of composts for soil amendment
- Extraction of different compounds (phenols, etc)

The effective treatment of OMW at a reasonable cost usually requires a combination of various technologies

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Olive Mill Structure in Greece

Typical characteristics:

Family owned, small enterprises (more than 2,000).

They cannot afford sophisticated OMW treatment facilities.

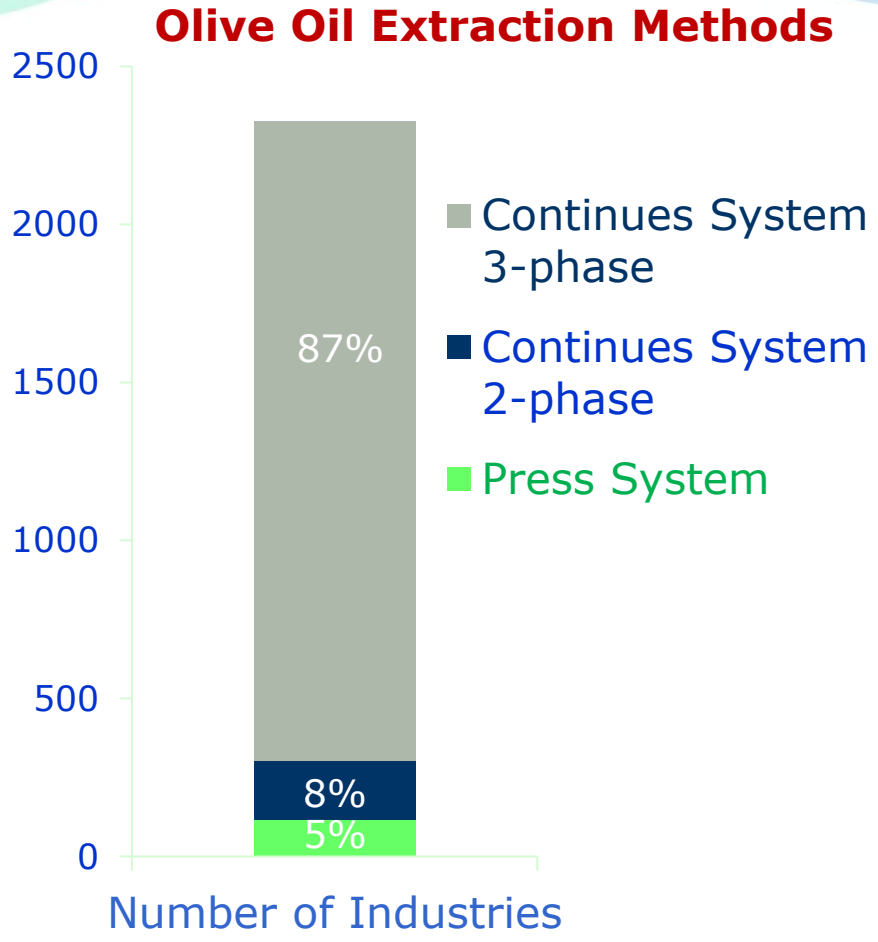
Average proccessing capacities

Classical (press): 0.4-2.0 ton/h

Centrifugal: 2.0-8.0 ton/h

There is no political will to enforce existing Environmental Legislation

Nearby houses and hotel owners dissatisfied with prevailing odors and the current state of the rivers.



OMW – current situation in Greece

- For large olive mills sophisticated combinations work successfully because can afford the cost (construction and/or operation).
- For small family-based mills the cost is quite high, not affordable

The present situation in this case is:

- Storage in open evaporation ponds, **or**
- Direct disposal into the rivers or the sea causing serious environmental problems

Advantages:

- Low or without cost

Disadvantages:

- Pollution of surface or ground waters
- Centers for development of different insects
- Odors produced cause serious problems in villages or tourists

To reduce bad odors CaO is added.

The solid residues, after the evaporation of liquids, with the proper treatment can be used as soil amendment.

New technologies are developing…

Current situation in Greece: Composting

- Take place within the installations of medium-size olive extraction plants.
- INPUT: Oil extraction by-products (Olive pomace, leaves, OMW
- PRODUCTS: High quality organic compost 'HUMO-OLEA'

Capacity of 700 – 2000 tones per year

Fenton de-toxification and gradual composting

Compost production

Complete control of pollution
Strengthens the circular economy

Use of 2 vs. 3 phase decanters

- In Greece some years ago, 2 phase decanters were pushed in the market as the solution to the OMW problem…
- Essentially the problem was transferred from the olive mills to the pomace processing plants!
- Reduced income to olive mill owners from sales to pomace plants → Reverse to "2.5 phase"
- Woody biomass very popular these days for home heating!...

Olive mill owners still looking for a "low" cost solution…

EU may impose penalties from 2018 to the Greek Government…

Current trend:

- Reduction of the number of olive extraction plants by merging and transformation to 2phase (subsidies)
- Modernization of pomace processing plants to accept the 2phase pomace (subsidies)

OMW management technologies in action in EU

LIFE program: OLEICO+ Raise awareness among the olive industry operators about the careless disposal of the olive waste. Provide information on technological/financial opportunities, in order to adopt eco-friendly technologies for the recovery and recycling of these wastes.

Technology selection criteria

Key criterion: The technology must be in use for at least one year at an olive mill, it should be "licensed" and visited while in operation by one of the partners.

Less than 15 technologies were indentified.

Technologies from Italy, Spain, Portugal and Greece, including soil application, that were evaluated and their main characteristics are presented.

Composting in windrows

Country: *SPAIN, Area: Guadalcazar, Córdoba*
Company: *Aceites Coto Bajo EXP Agric. S.A.*
Amount: *25.000 m³ two-phase OMW per year.*
INPUT: *40% two-phase OMW+ 40% chicken manure + 20% leaves*
PRODUCTS: *Organic compost*

Technical problems:
1) Non-homogeneity of raw materials.
2) Bad odours during start up period.

FINAL PRODUCT: 30.000 ton/year
Land use: 2 X15.000 m² (dimensions 5mX100mX2,5m)

Investment cost:
300,000 € civil engineering works
300,000 € turn over equipment

Operating cost:
6 h/week X 15 €/h
Production cost: 0.05-0.06 €/kg-compost (expected to be reduced to 0.03 €/kg)

Composting in a U-lane

Country: SPAIN Area: El Molar - Cazoria (Jaén)
Company: Geacom (UBEDA-ES).
Amount: 9.000 tons two-phase OMW per year
INPUTS: 40% two-phase OMW + 20% sheep manure (0.04 €/kg) + 40% leaves
PRODUCT: Organic compost (C/N < 12, N-P-K: 1.2-0.4-1.6, pH:9.6)
Investment cost: 300.000 € (50% financed by Andalusia)

There is a problem with the wide distribution of compost.

Operating cost: 2 h/day for the control of the process plus 3-4 h/week for maintenance.
Personnel cost: 6,800 €/year while the maintenance cost is 4,500 €/year.
The indirect revenue is estimated 200-250 €/ha/year savings in chemical fertilizers.

Electro-coagulation

Country: SPAIN. Area: Jaén, Company: CYCLUS ID

Process steps: Homogenaization, Filtration (0.3 mm)

Electro-coagulation, Floatation & pH control

Drying of solids

INPUT: 2-phase OMW (after centrifugation)

OUTPUT: Treated effluents with COD (~1500 mg/L) acceptable by local WWTPs

Amount: 2 m3/h → 4.000 m3/year,

Investment Cost: 100,000 €

Area required: 25 m2 inside the olive mill housing with a capacity of treating 2.0 m3/h OMW.

Skilled workforce of 2 h/day and 1 person for 1 h/day is required for managing WW physicochemical parameters

Operational cost: between 1.5-1.8 €/m3.

Aerobic biological trickling filter + constructed wetland

Country: **GREECE,** Area: Amphilochia, Company: D. Vagenas (U. Ioannina/U. Western Greece).)

INPUTS: OMW+ pomace + leaves

Bioreactor: Continuous recirculation with a residence time of 24h. → Sedimentation → Constructed wetlands

PRODUCT: compost (sludge + leaves + pomace)

Investment cost:
30,000 € equipment + land cost for CW
+ 5-10,000 € composting unit (OMW treated: 30 m^3/day)

Operating cost: 0.1 € / m^3 (electricity)

Manpower: 2h / day
Land use: Composting: 10m X 4 m
Bioreactor: 3,5m X 1,8 m, CW: 2.000 m^2

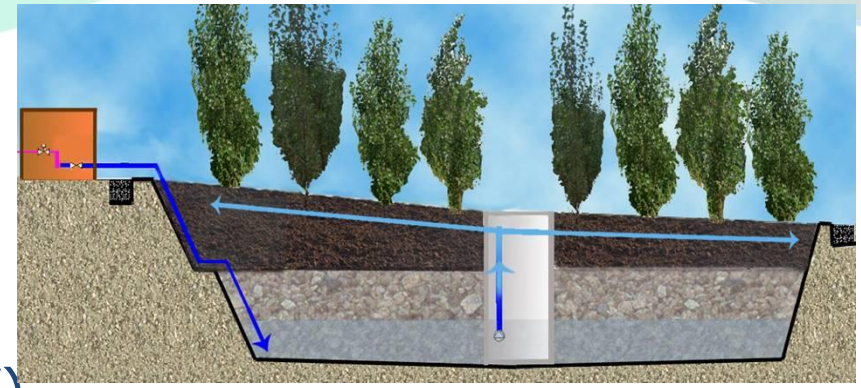
Evaporation – Hydrolysis–Oxidation : E.H.O.®

Country: **GREECE,** Area: Sparti (Laconia)
Company: ENVITEC A.E.
INPUT: *OMW*
PRODUCTS:
1) Irrigation water (80-85% OMW)
2) Bio-fuel 4.000 kcal/kg (in powder form 10 ton from100 m3 OMW)

Investment cost:
100-150 € / m^3 (i.e., for 1000 m3 OMW → 100-150.000 €)
Operating cost:
3-5 € / m^3 (electricity– 31 kWh/m3)
Manpower: One person per shift.
Expected income: 40 €/ton bio-fuel
Land requirements: very small (<100 m^2)
Problems:
Cost & need of specialized personnel.

Phytoremediation

Country: ITALY, Area: Terni, Company: ISRIM S.C.a r.l.



Amount: 50-10.000 m^3 OMW/year

INPUT: OMW

PRODUCT: Wood

Land use: 1,5 – 2 m^2/m^3

(i.e. 1500-2000 m^2 / 1000m^3 OMW)

Investment cost: 100-110 € / m^3

(i.e., 1000 m^3 OMW/year → 100.000 €)

Operating expenses:

0.2 € / m^3 /year (electricity for the pump)

Manpower: Not needed.

Expected income: 0.1 € / m^3 /year (from wood sales)

Problems:

Initial investment cost

Land requirements (30% more than a 1 m deep evaporation pond)

Anaerobic digestion in a WWTP

Country: PORTUGAL, Area: Abrantes

Company: LNEG – INETI
(Renewable Energy dept)
Investment cost: *300.000 €*

Operating cost: 14.000 €/year

INPUTS: *5 ton/day OMW+ 46 ton/day activated sludge + 1,5 ton/day OM-solids + 2,2 ton/day municipal organic waste*

PRODUCTS: *300 m^3/day biogas + Irrigation water + compost (1.6 m^3/day)*
Expected Income: *26,000 € (0.2 € / kWh x 357 kWh/d x 365 d)*

The process has eco-friendly features since it produces three by-products: water suitable for irrigation, sludge for agricultural soil enrichment and energy for WWTP running.

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Bio-fuel pellets Biocombus

Country: PORTUGAL, Area: Murca

Company: Universidade de Trás-os-Montes

Investment cost: 8.88 €/ton

Operating cost: 26.48 €/ton

INPUT: 20.000 tons pomace + 3.000 tons cork sawdust.

PRODUCT: *13.500* ton/year pellets/briquettes (20,6 MJ/kg)

Expected income: 140 €/ton (sales of pellets/briquettes)

Area required for the installation: 0.07 m^2/t wet bagasse.

The technology is eco-friendly since the whole input material coming in the plant is completely transformed in pellet.

The technology has been patented (UTAD-EP 1849756 A1) by the University of Traseos-Montes e Alto Duro of Portugal.

CIP-Eco-innovation: Filtration with sawdust & phytoremediation

Country: Greece, Area: Crete

Company: Technical University of Crete, MESOGIAKI S.A.)

Investment cost (for 1500 to 2.000 m^3/year OMW):

Extraction of polyphenols: 250.000 € (equipment)

Phytoremediation with poplars: 100.000 €

Composting unit: 50.000 € (equipment & concrete)

INPUTS: OMW

Sequential filtration of OMW through a series of filters consisting of

- Natural materials (peat, sawdust) Chemicals (resins)

COD reduction by 75-80%.

Phytoremediation: "Light OMW" taken to poplars field

Extraction of polyphenols (from ion exchange resins)

Composting of sawdust & leaves

Products: wood, polyphenols, compost

OMW application on the soil

Research has shown that soils can be used as a natural system for OMW treatment since organic compounds are fast decomposed and soils have high buffering capacity

Advantages:

- Low cost
- Increase of soil fertility (mostly K)
- Fast decomposition of the organic part of OMW
- No pollution of surface or ground water
- Increase of yield (corn, grapevines)

Phytotoxicity:

- Only in annual crops if planted before or right after the application
- Reduction of germination percentage
- Negative effects are not observed if crops are planted about 2 months after the application
- For olive trees, only in young trees when high doses were applied

(Bonari et al., 1993; Garcia-Ortiz et al., 1999; Di Giovacchino et al., 2002)

OMW application schedule on olive orchards

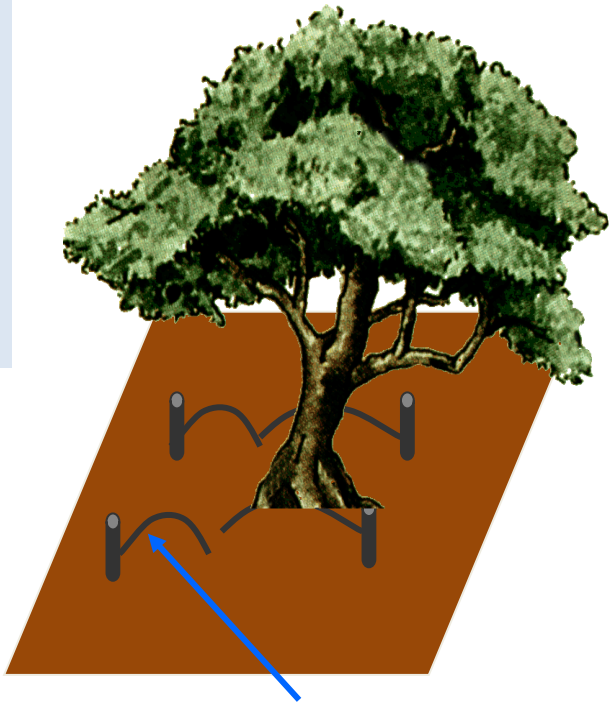
The soil application of OMW is practiced in many olive growing countries. In the IOTSP studied the effects of OMW application in olive orchards in the frame of WAWAROMED programme of EU.

Treatments:

CNTL: Control (without OMW application)

OMW: Row OMW aapplication (November to March, after 24 hours for sedimentation or mechanical separation of solid particles)

	OMW application schedule		
	1st year	2nd year	3rd year
No of application	3 x	5 x	5 x
Dose	300 lt/tree	300 lt/tree	300 lt/tree
Annual dose	900 lt/tree 250 m^3/ha	1500 lt/tree 416 m^3/ha	1500 lt/tree 416 m^3/ha



OMW application lay-out on the olive orchard

Solid particle removal

Filtration Alternatives:

Use of different filters

+

Subsequent passing of OMW through sawdust filter (particles <0.2 mm)

OR

Industrial filtration system

eco Olive Cleaner

- Filtration unit (self cleaning) to remove suspended solids by 99%.

Or use of Coagulation and Sedimentation: cost of chemicals

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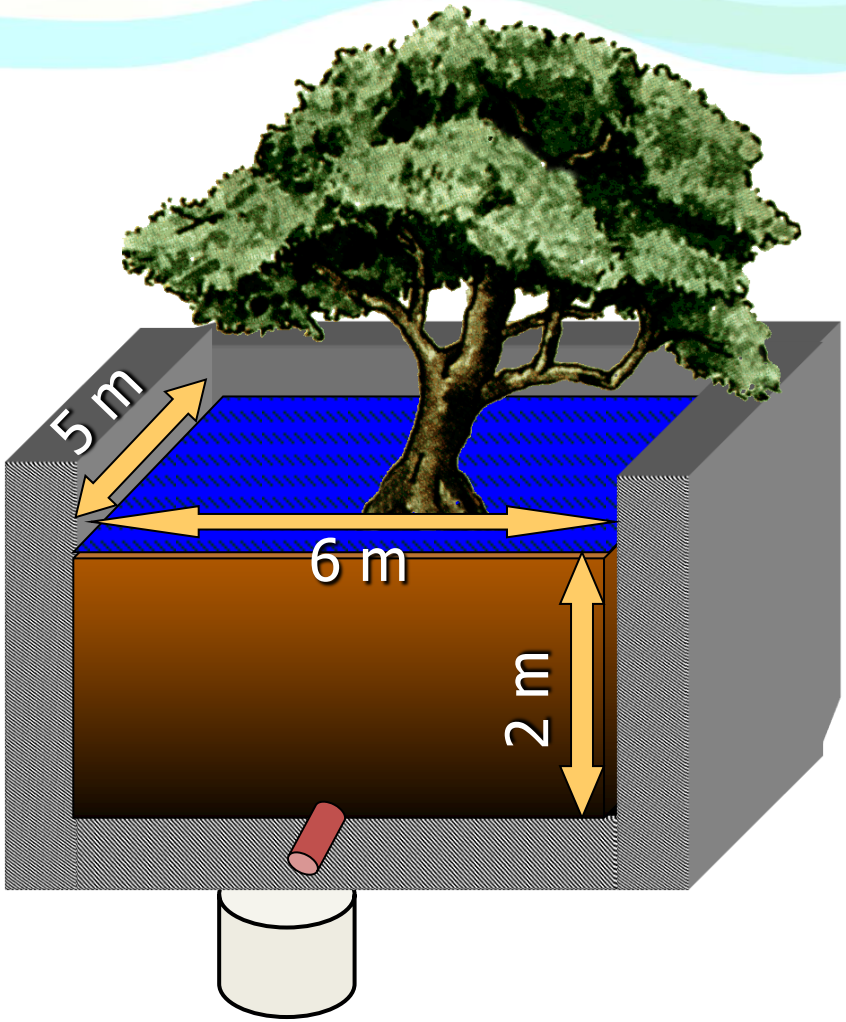
OMW application in lysimeter



Collection of drained water at 2 m depth

Lysimeter dimensions:

Surface: 30 m²

Depth: 2 m

Olive trees:

Number: 1/treatment

Age: 20 έτη

Cultivar: 'Kalamata'

Treatments:

CNTR

OMW

Duration period:

Dec 2001–May 2003

Soil characteristics:

The same with olive orchard

Results – Soil Analysis

The application of OMW did not affect most of the soil parameters measured. After 3 years of application the following changes were observed:

Increase of K **(Mechri et al., 2007; Di Serio et al., 2008; Kavvadias et al., 2010, Di Bene et al. 2013)**

Increase of N **(López-Piñeiro et al. 2006; Di Bene et al. 2013)**

Increase of phenolic substances **(Alianello, 2001; Saadi et al., 2007; Di Bene et al. 2013)**

Table 2. Soil properties at 2 soil depths after 3 year of OMW application

Treat.	pH	EC (dS/m)	N_{Kjeld} (%)	K_{exch} (mg/kg)	P_{Olsen} (mg/kg)	Na (mg/kg)	Phenols (mg/kg)	% Org. Matter
				0-25 cm				
CTRL	**6,8**	**0,31**	**0,79b***	**123,6b**	**70,8**	**38,5**	**0,0 b**	**0,92**
OMW	**6,9**	**0,37**	**1,21 a**	**773,6a**	**79,0**	**44,5**	**17,5 a**	**1,01**
				25-50 cm				
CTRL	**6,8**	**0,31**	**0,68**	**83,0b**	**30,2**	**46,0**	**0,0 b**	**0,80**
OMW	**6,9**	**0,26**	**0,89**	**235,5a**	**50,5**	**44,5**	**7,1 a**	**0,88**

Results – Soil Analysis

The concentration of K in the soil showed an increasing trend during the experimental period and tended to level off towards the end of the experiment

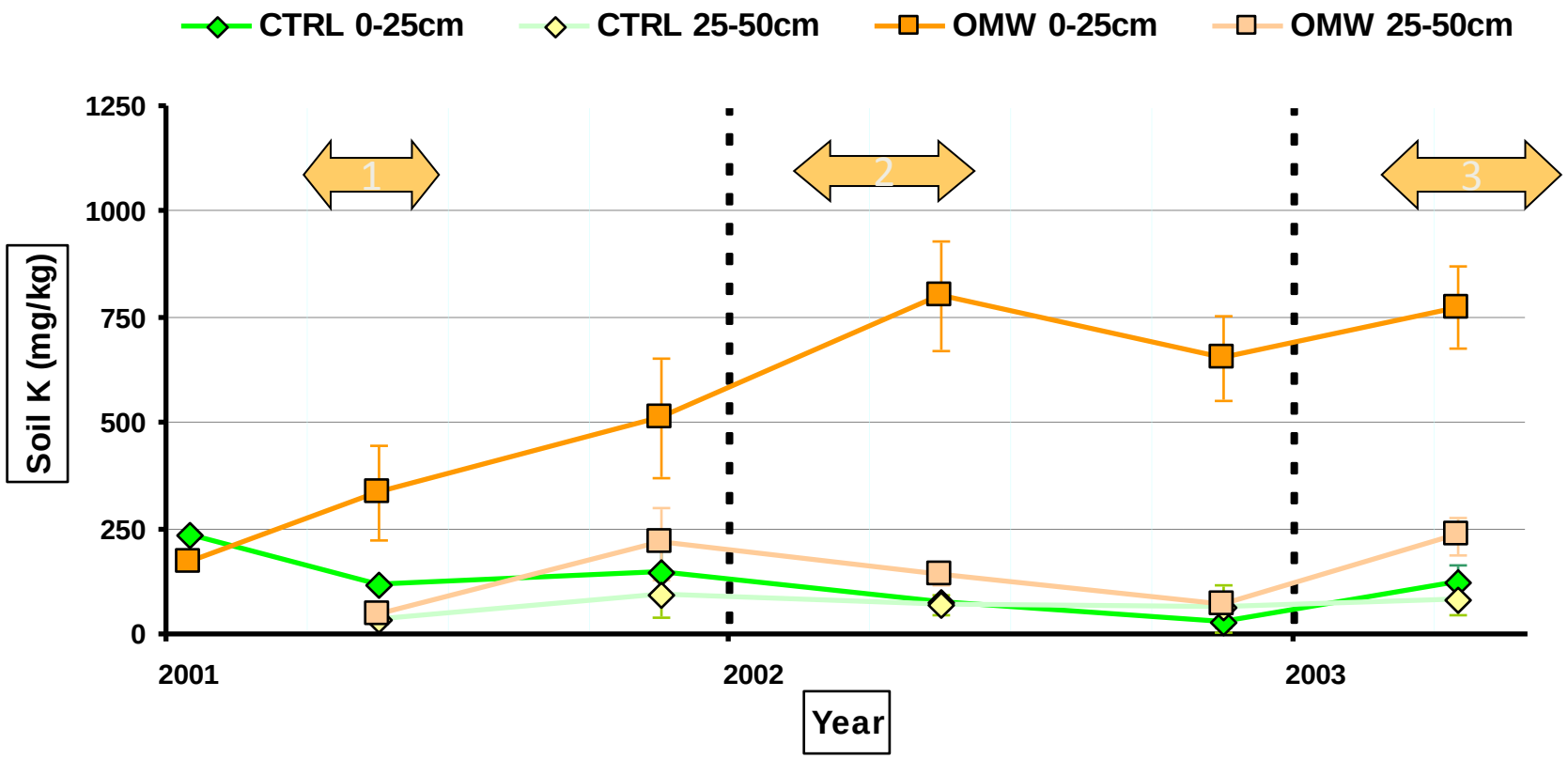


Figure 1. Concentration of soil K over time at two different soil depths

Results – Soil Analysis

Concentration of total phenols did not show an increasing trend during the experimental period. It was higher in April and lower before the subsequent OMW application period (Sierra et al., 2001; Gamba et al., 2005;Saadi et al., 2007)

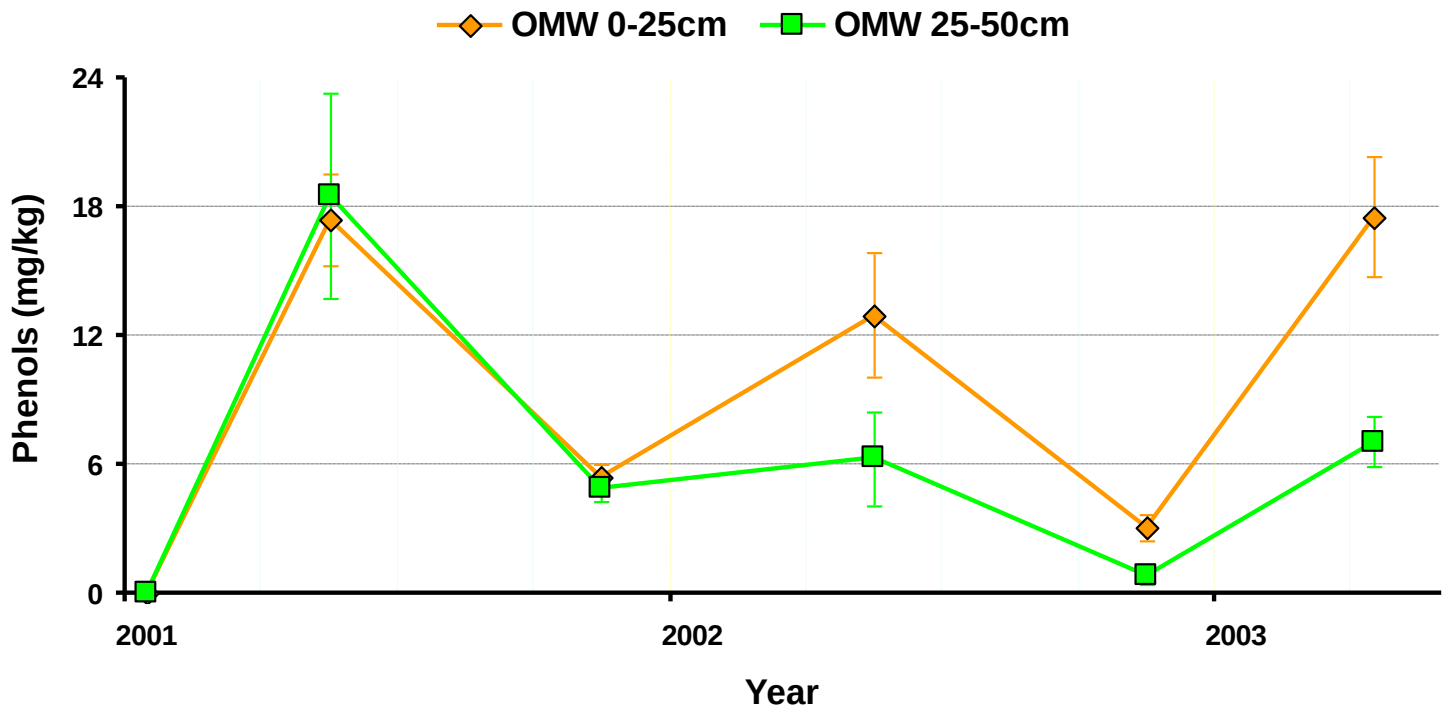


Figure 2. Concentration of phenolic compounds over time at 2 soil depths

Results – Physiological parameters

Photosynthesis tended to be lower in OMW treated plants early in the growing season, but this effect was

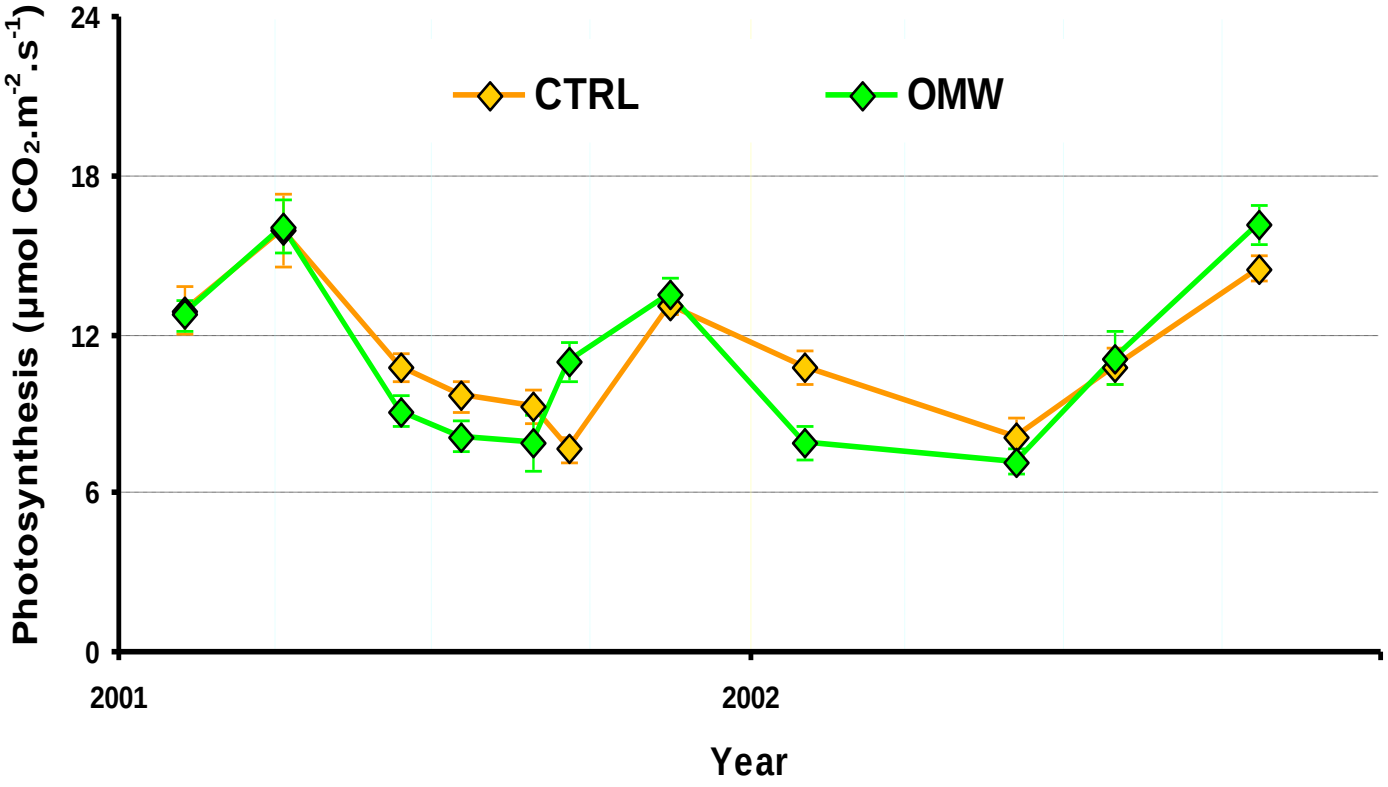


Figure 4. Change on photosynthesis over time for CTRL and OMW treated plants (data points represent the mean of 4 trees)

Results – Fruit yield

- Fruit yield and oil composition were not affected by OMW application

Table 3. Fruit yield, oil content and K concentration for CTRL and OMW treated plants after 2 periods of OMW application

Treatment	Yield (kg/tree)	Oil content (%)	K (%)
CTRL	**32.2**	**17.4**	**3.0**
OMW	**33.9**	**16.6**	**3.1**
	NS	NS	NS

NS: Treatments did not differ significantly (α=0,05) Values are the means from 4 trees

Mechri et al. (2009) reported a significant increase in total phenol content of oil after agronomic application of OMW. Tocopherol content, on the contrary, decreased with OMW application. The fatty acid composition of the oil was not affected by the treatments.

Results – Drainage water

The composition of the drainage water was not affected by the application of OMW

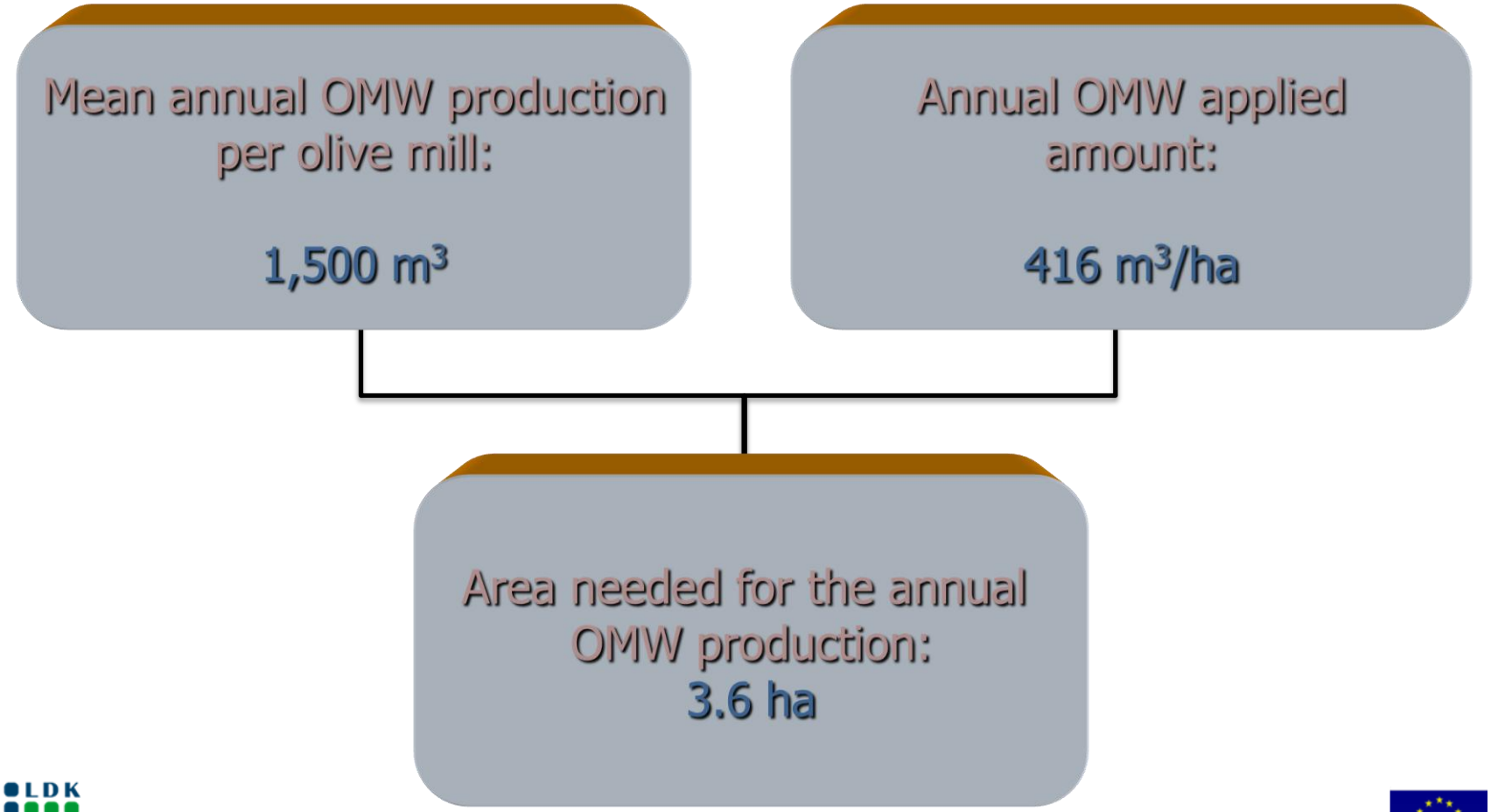
Table 4. Composition of drained effluent from the control and OMW treated

Parameter	20-2-2003		24-2-2003		7-2-2004		18-3-2004	
	CTRL	OMW	CTRL	OMW	CTRL	OMW	CTRL	OMW
pH	6,7	6,7	6,8	6,7	6,8	6,8	6,9	6,9
EC (dS/m)	3,7	4,0	4,2	3,7	4,5	3,9	3,6	3,5
K (ppm)	12,7	13,7	12,7	8,0	8,7	10,3	6,5	6,5
Na (ppm)	494	503	506	484	620	471	294	298
COD (g/l)	n.d.*	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
Phenols (g/l)	0	0	0	0	0	0	0	0

* Non detectable concentration by the instrument (almost zero)

Applicability of the method

In practice, in order to apply the method it is required a total olive orchard area of 3.6 ha (280 trees per ha), for the annual OMW production, which easily available around its olive mill.



Cost analysis

Table 5. Cost analysis of the method

Expenses	Cost of investment	Annual cost	Remarks
Personnel		5.000 €	Seasonal personnel for 5 months
Tractor 70 HP	35.000 €	3.500 €	Calculated for a depreciation period of 10 years
2 m^3 tank with trailer	7.500 €	750 €	Calculated for a depreciation period of 10 years
Maintenance		1.300 €	
Total	42.500 €	10.550 €	

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Cost analysis

The cost of the method is reasonable, compared with sophisticated methods, under the present very bad situation of olive sector

Annual cost of the method:

10.550 €

Annual production of OMW :

1.500 m^3

Cost per lt of produced OMW:

0,007 €

For the application of the method is required:

a) Update of legislation (guidelines) to the latest results of research in all olive growing countries

b) Detailed study for each case to determine the application dose according to soil and climatic conditions of the area

Publications - Implementation

Agriculture, Ecosystems and Environment 138 (2010) 293–298

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Application of olive mill wastewater to a Cretan olive orchard: Effects on soil properties, plant performance and the environment

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ABSTRACT

The application of fresh olive mill wastewater (OMW) to the soil surface of an olive (*Olea europaea*, L.) orchard was studied as a low cost alternative method for the disposal of this waste. OMW were applied to a Cretan orchard with 20-year-old trees (cv. 'Kalamata') during winter time for 3 consecutive years, at a maximum annual rate of 420 m^3 ha^{-1}. The effects on soil properties and composition (pH, EC, N, P, K, organic matter and phenolic content), yield, photosynthesis and nutritional status of the trees were studied. In a separate experiment, the possibility for groundwater pollution was studied in large lysimeters (60 m^3 of soil volume). The most important effects on soil composition included a significant increase on availability of K, which enhanced soil fertility, and an increase of phenolic compounds in the OMW-treated soil. However, phenols decomposed rapidly and no accumulation trend was observed after subsequent applications. No other negative effects on soil properties and plant behavior were observed throughout the experimental period, while the composition of drainage water at a soil depth of 2 m was not altered by the application of OMW. Based on the dosage used, the cost for adopting the method was estimated to less than €0.007 kg^{-1} of processed olive fruit.

RECYCLING OF VEGETABLE WATER & OLIVE POMACE ON AGRICULTURAL LAND
(CFC/IOOC/04)

ACHIEVEMENTS OF PROJECT CFC /IOOC/04

"RECYCLING OF VEGETABLE WATER AND OLIVE POMACE ON AGRICULTURAL LAND"

GOOD PRACTICE IN VEGETABLE WATER AND COMPOST SPREADING ON AGRICULTURAL LAND: CASE OF OLIVE GROWING

Project Executing Agency CFC/IOOC/04
Agro-pôle Olivier ENA Meknès

Project CFC/IOOC/04 on the "*Recycling of vegetable water and olive pomace on agricultural land*" was set up by the Common Fund for Commodities (CFC) and the International Olive Council (IOC) for the benefit of four South and East Mediterranean olive growing countries: Algeria, Morocco, Tunisia and Syria.

The broad aim of the project was to transfer technology on the application of vegetable water (VW) and olive pomace on agricultural land and to highlight the advantages of these practices in raising crop yields and improving soil fertility as a feature of sustainable, environmentally friendly olive growing.

The soil application of OMW is practiced during 2014, 2015 and 2016 on 15 olive orchards in two Cooperatives (Peza and Mirabello) under specific licence from Regional Authority of Crete

Legislative aspects

Italian directive (1996):

80 m^3/ha for 3-phase and 50 m^3/ha for classical per year

Portugese Directive (2006):

50 m^3 ha per year

Greek Directive (up to 2011):

There was no regulation specifically addressing OMW. The OMW management were based on the Law 1650/86 "*For the Protection of the Environment*" «olive mill owners are obliged to provide an environmental impact assessment study». The Regional Environmental Agencies were authorised to provide working licenses to olive mills.

The updated circular letter YM/5784/23-1-1992 (No 4419/23-10-1992) and the Law 3010/2002 refers to the problems encountered due to OMW disposal, the need for an efficient pretreatment and the care required in order to avoid disposal to various water resources.

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Legislative aspects

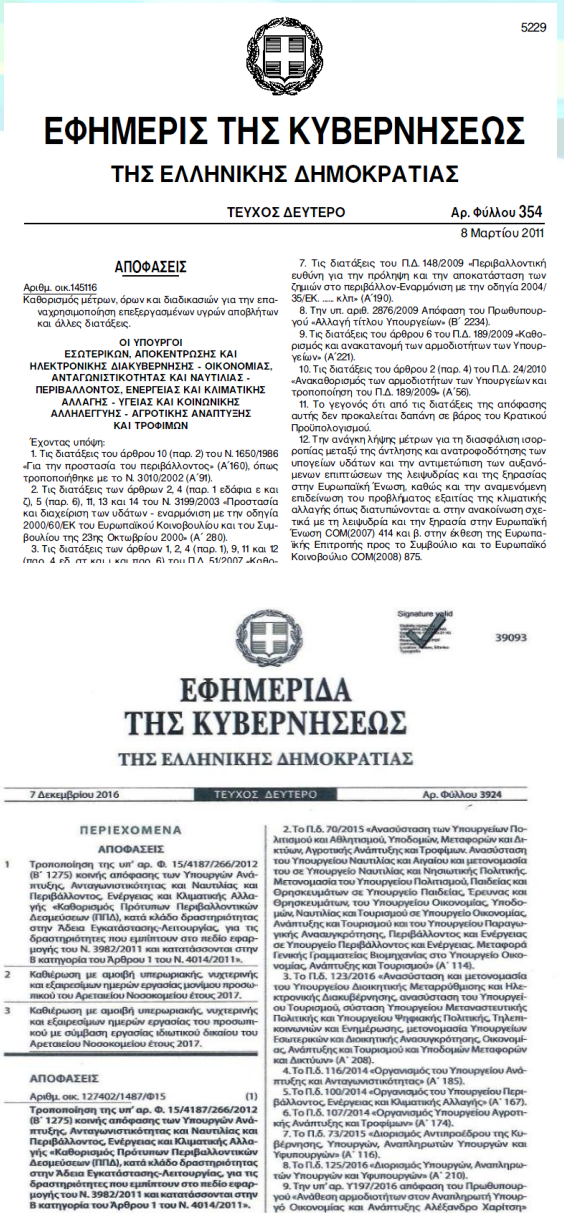
Regional environment offices are supplying working licenses to olive mills. For example, OMW management in the Prefecture of 'Messinia' is based on the modification of a 3-phase decanter system into a 2-phase, in the Prefecture of Lesvos olive mill wastewater was discharged until recently untreated onto aquatic ecosystems and in Prefecture of Crete the storage in evaporation ponds were obligatory.

K.Y.A. 45118/02-02-2011

New law on REUSE of municipal & industrial wastewater

KYA 127402/1487/Φ15/7-12-2016

Allow the controlled application, after a pre-tratment, of OMW to olive orchards and other crops at a maximum quantity 80 - 200 m^3/ha, depending on climatic and soil conditions



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ΤΗΣ ΕΛΛΗΝΙΚΗΣ ΔΗΜΟΚΡΑΤΙΑΣ

ΤΕΥΧΟΣ ΔΕΥΤΕΡΟ Αρ. Φύλλου 354

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ΑΠΟΦΑΣΕΙΣ

Αριθμ. οικ.145116

Καθορισμός μέτρων, όρων και διαδικασιών για την επαναχρησιμοποίηση επεξεργασμένων υγρών αποβλήτων και άλλες διατάξεις.

ΟΙ ΥΠΟΥΡΓΟΙ ΕΣΩΤΕΡΙΚΩΝ, ΑΠΟΚΕΝΤΡΩΣΗΣ ΚΑΙ ΗΛΕΚΤΡΟΝΙΚΗΣ ΔΙΑΚΥΒΕΡΝΗΣΗΣ - ΟΙΚΟΝΟΜΙΑΣ, ΑΝΤΑΓΩΝΙΣΤΙΚΟΤΗΤΑΣ ΚΑΙ ΝΑΥΤΙΛΙΑΣ - ΠΕΡΙΒΑΛΛΟΝΤΟΣ, ΕΝΕΡΓΕΙΑΣ ΚΑΙ ΚΛΙΜΑΤΙΚΗΣ ΑΛΛΑΓΗΣ - ΥΓΕΙΑΣ ΚΑΙ ΚΟΙΝΩΝΙΚΗΣ ΑΛΛΗΛΕΓΓΥΗΣ - ΑΓΡΟΤΙΚΗΣ ΑΝΑΠΤΥΞΗΣ ΚΑΙ ΤΡΟΦΙΜΩΝ

Έχοντας υπόψη:

1. Τις διατάξεις του άρθρου 10 (παρ. 2) του Ν. 1650/1986 «Για την προστασία του περιβάλλοντος» (Α'160), όπως τροποποιήθηκε με το Ν. 3010/2002 (Α'91).

2. Τις διατάξεις των άρθρων 2, 4 (παρ. 1 εδάφια ε και ζ), 5 (παρ. 6), 11, 13 και 14 του Ν. 3199/2003 «Προστασία και διαχείριση των υδάτων - εναρμόνιση με την οδηγία 2000/60/ΕΚ του Ευρωπαϊκού Κοινοβουλίου και του Συμβουλίου της 23ης Οκτωβρίου 2000» (Α' 280).

3. Τις διατάξεις των άρθρων 1, 2, 4 (παρ. 1), 9, 11 και 12 (παρ. 4 εδ. στ και ι και παρ. 6) του Π.Δ. 51/2007 «Κάθο-

7. Τις διατάξεις του Π.Δ. 148/2009 «Περιβαλλοντική ευθύνη για την πρόληψη και την αποκατάσταση των ζημιών στο περιβάλλον-Εναρμόνιση με την οδηγία 2004/35/ΕΚ. ..... κλπ» (Α'190).

8. Την υπ. αριθ. 2876/2009 Απόφαση του Πρωθυπουργού «Αλλαγή τίτλου Υπουργείων» (Β' 2234).

9. Τις διατάξεις του άρθρου 6 του Π.Δ. 189/2009 «Καθορισμός και ανακατανομή των αρμοδιοτήτων των Υπουργείων» (Α'221).

10. Τις διατάξεις του άρθρου 2 (παρ. 4) του Π.Δ. 24/2010 «Ανακαθορισμός των αρμοδιοτήτων των Υπουργείων και τροποποίηση του Π.Δ. 189/2009» (Α'56).

11. Το γεγονός ότι από τις διατάξεις της απόφασης αυτής δεν προκαλείται δαπάνη σε βάρος του Κρατικού Προϋπολογισμού.

12. Την ανάγκη λήψης μέτρων για τη διασφάλιση ισορροπίας μεταξύ της άντλησης και ανατροφοδότησης των υπογείων υδάτων και την αντιμετώπιση των αυξανόμενων επιπτώσεων της λειψυδρίας και της ξηρασίας στην Ευρωπαϊκή Ένωση, καθώς και την αναμενόμενη επιδείνωση του προβλήματος εξαιτίας της κλιματικής αλλαγής όπως διατυπώνονται: α. στην ανακοίνωση σχετικά με τη λειψυδρία και την ξηρασία στην Ευρωπαϊκή Ένωση COM(2007) 414 και β. στην έκθεση της Ευρωπαϊκής Επιτροπής προς το Συμβούλιο και το Ευρωπαϊκό Κοινοβούλιο COM(2008) 875.

Signature valid

39093

ΕΦΗΜΕΡΙΔΑ ΤΗΣ ΚΥΒΕΡΝΗΣΕΩΣ

ΤΗΣ ΕΛΛΗΝΙΚΗΣ ΔΗΜΟΚΡΑΤΙΑΣ

7 Δεκεμβρίου 2016 ΤΕΥΧΟΣ ΔΕΥΤΕΡΟ Αρ. Φύλλου 3924

ΠΕΡΙΕΧΟΜΕΝΑ

ΑΠΟΦΑΣΕΙΣ

1 Τροποποίηση της υπ' αρ. Φ. 15/4187/266/2012 (Β' 1275) κοινής απόφασης των Υπουργών Ανάπτυξης, Ανταγωνιστικότητας και Ναυτιλίας και Περιβάλλοντος, Ενέργειας και Κλιματικής Αλλαγής «Καθορισμός Πρότυπων Περιβαλλοντικών Δεσμεύσεων (ΠΠΔ), κατά κλάδο δραστηριότητας στην Άδεια Εγκατάστασης-Λειτουργίας, για τις δραστηριότητες που εμπίπτουν στο πεδίο εφαρμογής του Ν. 3982/2011 και κατατάσσονται στην Β κατηγορία του Άρθρου 1 του Ν. 4014/2011».

2 Καθιέρωση με αμοιβή υπερωριακής, νυχτερινής και εξαιρεσίμων ημερών εργασίας μονίμου προσωπικού του Αρεταιείου Νοσοκομείου έτους 2017.

3 Καθιέρωση με αμοιβή υπερωριακής, νυχτερινής και εξαιρεσίμων ημερών εργασίας του προσωπικού με σύμβαση εργασίας ιδιωτικού δικαίου του Αρεταιείου Νοσοκομείου έτους 2017.

ΑΠΟΦΑΣΕΙΣ

Αριθμ. οικ. 127402/1487/Φ15 (1)

Τροποποίηση της υπ' αρ. Φ. 15/4187/266/2012 (Β' 1275) κοινής απόφασης των Υπουργών Ανάπτυξης, Ανταγωνιστικότητας και Ναυτιλίας και Περιβάλλοντος, Ενέργειας και Κλιματικής Αλλαγής «Καθορισμός Πρότυπων Περιβαλλοντικών Δεσμεύσεων (ΠΠΔ), κατά κλάδο δραστηριότητας στην Άδεια Εγκατάστασης-Λειτουργίας, για τις δραστηριότητες που εμπίπτουν στο πεδίο εφαρμογής του Ν. 3982/2011 και κατατάσσονται στην Β κατηγορία του Άρθρου 1 του Ν. 4014/2011».

2. Το Π.Δ. 70/2015 «Ανασύσταση των Υπουργείων Πολιτισμού και Αθλητισμού, Υποδομών, Μεταφορών και Δικτύων, Αγροτικής Ανάπτυξης και Τροφίμων, Ανασύσταση του Υπουργείου Ναυτιλίας και Αιγαίου και μετονομασία του σε Υπουργείο Ναυτιλίας και Νησιωτικής Πολιτικής, Μετονομασία του Υπουργείου Πολιτισμού, Παιδείας και Θρησκευμάτων σε Υπουργείο Παιδείας, Έρευνας και Θρησκευμάτων, του Υπουργείου Οικονομίας, Υποδομών, Ναυτιλίας και Τουρισμού σε Υπουργείο Οικονομίας, Ανάπτυξης και Τουρισμού και του Υπουργείου Παραγωγικής Ανασυγκρότησης, Περιβάλλοντος και Ενέργειας σε Υπουργείο Περιβάλλοντος και Ενέργειας, Μεταφορά Γενικής Γραμματείας Βιομηχανίας στο Υπουργείο Οικονομίας, Ανάπτυξης και Τουρισμού» (Α' 114).

3. Το Π.Δ. 123/2016 «Ανασύσταση και μετονομασία του Υπουργείου Διοικητικής Μεταρρύθμισης και Ηλεκτρονικής Διακυβέρνησης, ανασύσταση του Υπουργείου Τουρισμού, σύσταση Υπουργείου Μεταναστευτικής Πολιτικής και Υπουργείου Ψηφιακής Πολιτικής, Τηλεπικοινωνιών και Ενημέρωσης, μετονομασία Υπουργείων Εσωτερικών και Διοικητικής Ανασυγκρότησης, Οικονομίας, Ανάπτυξης και Τουρισμού και Υποδομών Μεταφορών και Δικτύων» (Α' 208).

4. Το Π.Δ. 116/2014 «Οργανισμός του Υπουργείου Ανάπτυξης και Ανταγωνιστικότητας» (Α' 185).

5. Το Π.Δ. 100/2014 «Οργανισμός του Υπουργείου Περιβάλλοντος, Ενέργειας και Κλιματικής Αλλαγής» (Α' 167).

6. Το Π.Δ. 107/2014 «Οργανισμός Υπουργείου Αγροτικής Ανάπτυξης και Τροφίμων» (Α' 174).

7. Το Π.Δ. 73/2015 «Διορισμός Αντιπροέδρου της Κυβέρνησης, Υπουργών, Αναπληρωτών Υπουργών και Υφυπουργών» (Α' 116).

8. Το Π.Δ. 125/2016 «Διορισμός Υπουργών, Αναπληρωτών Υπουργών και Υφυπουργών» (Α' 210).

9. Την υπ' αρ. Υ197/2016 απόφαση του Πρωθυπουργού «Ανάθεση αρμοδιοτήτων στον Αναπληρωτή Υπουργό Οικονομίας και Ανάπτυξης Αλέξανδρο Χαρίτση»

Conclusions

There is a need for a normative, that imposes a common behaviour among EU and possibly all olive producing countries in Mediterranean region

All suggestions must be in tune with latest legislation

Ministries should accept current set of BATs (Best Available Technologies)

With respect to "direct disposal" to the ground:

- Any method that reduces COD-total (homogenized sample) by 70-90% is acceptable as equivalent secondary biological treatment
- OMW does not contain human pathogens and hence, no chlorination is needed
- Reduction by filtration typically >70% hence OK for direct disposal
- Address issue of bad odours (major "non environmental" problem)

LDK CONSULTANTS

SWIM and Horizon 2020 Support Mechanism

Working for a Sustainable Mediterranean, Caring for our Future

Thank you for your attention.

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